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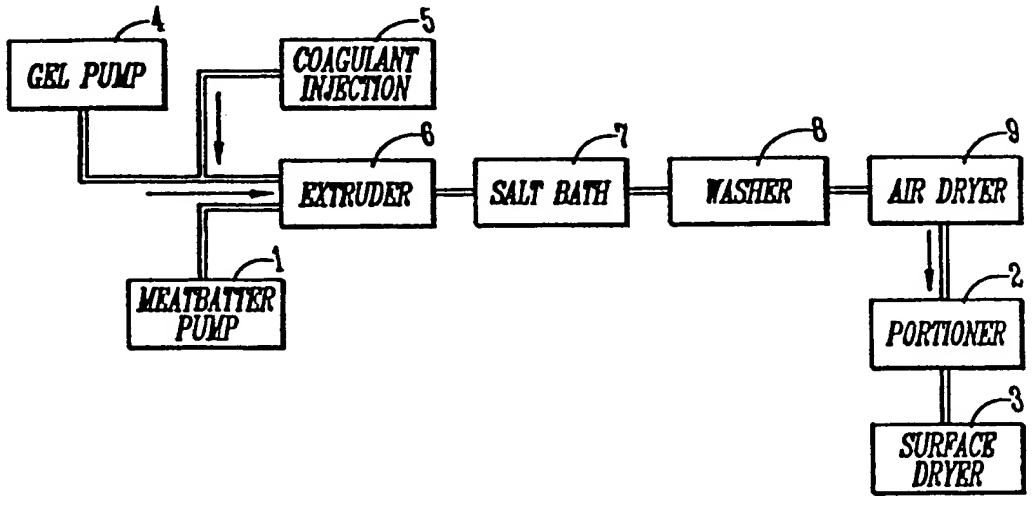

(57) Abstract

A method and apparatus of continuously processing an elongated strand (1) of plastic edible material coated with a coagulated coating. A coextruder (6) has interchangeable parts (9B) to provide strands of varying diameter. The strand is conveyed through a closed tubular conveyor (106) through which a brine fluid is simultaneously passed. The drying of the strand includes an infrared drier (3). A linker and/or crimper (2) is provided.

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TITLE: CONTINUOUS FOOD PROCESSING SYSTEM

BACKGROUND OF THE INVENTION

This invention relates to a continuous food processing system whereby an edible plastic food strand of meat or the like is co-extruded with a coated material to be processed into a casing. This coating material may consist of a mixture or gel with a coagulatable protein, and reinforcing means. More specifically this invention relates to a method for the manufacturing whereby the method includes the steps of co-extruding a principally equal layer of gel around an extruded edible product and the treatment of the extruded gel coating with chemical and physical means for coagulation.

Such a method is generally known. These known methods are mainly being used for the co-extrusion of sausage or sausage-like materials. In principal this method involves the extrusion of a cylindrical nucleus of a sausage mix and simultaneously the extrusion around the sausage mix of an outside coating which consists of a gel with a collagen protein. The proteins in the gel are coagulated with the aid of a coagulation means.

The term "coagulation" is a term of art in the production of collagen coated sausage material and is not strictly scientific in the sense in which it is used. Coagulation as it is used in this specification refers to the step involving hardening and stabilization of the casing. This is principally achieved in two ways; firstly by removal of water from the collagen gel, and secondly by cross-linking the collagen fibers.

In the generally known methods the water content gel coating is lowered with the assistance of osmosis by leading the strand of foodstuffs through a concentrated salt bath. Thereafter an air drying step is used to further enhance the strength of the sausage casing. After this treatment the mechanical properties of the casing are insufficient to allow for conventional twist linking, clipping, typing, or hanging of the foodstuff, i.e. sausage, strand. With this usual method it is habitual to crimp the co-extruded strand of foodstuff and cut it into independent elements and these elements are placed in a hot air dryer for the treatment of individual elements (for example drying, smoking etc.)

This known method has a number of disadvantages. The first disadvantage is that a sausage is manufactured in which the organoleptical properties are insufficiently equal to sausage which has been manufactured with a natural or artificial casing which are known in the trade. A second disadvantage is that the method limits itself to the manufacturing of smoked/cooked sausage and fresh sausage. Dried semi-dried and fresh sausage cannot be economically manufactured. A third disadvantage is that usual smoke-and/or cooking installations cannot be used economically in the further processing. With the known method the meat mix is provided with a collagen coverage while with the traditional methods a casing is used which strongly and flexibly encloses the meat mix entirely during the further processing and shapes the sausage.

Further, a similar method is known from the international patent application WO93/12660 whereby

it is intended to avoid the aforementioned problems. This method equally includes the steps of coextruding a mainly equal layer of collagen gel around an extruded edible product and the chemical coagulation of the extruded collagen gel while using a chemical coagulation means, though without the step of drying with hot air in order to achieve a coagulated collagen casing around the edible product, which has sufficient strength to allow mechanical separation into individual foodstuff elements which are connected to each other, especially sausages.

Also, with this known method the aforementioned problems and disadvantages have not been resolved adequately. It has been demonstrated that a thus manufactured casing of collagen gel of co-extruded edible foodstuffs, i.e., sausages, has insufficient strength to allow traditional further processing. Furthermore a consequence of low casing strength is that the shape of the sausage rope is not consistent, principally in certain types of further processing. For instance, when strands of edible foodstuffs which are thus manufactured are being hung the partly "fluid" meat mix flows down which gives the edible foodstuffs a cone shape. Such a shape for sausages is undesirable. Additionally, due to the mechanical loading of the gel casing which is not strong enough rupture can occur. Also, the production speed with this known method is disadvantageously influenced by the still insufficient strength and shape rigidity of the casing. An additional disadvantage is that, due to the lengthy stay in the coagulation bath, the salt content in the casing and in the meat mix, is high.

This results in unwanted organoleptical and physical changes of the sausage mix, such as in taste, consistency and firmness of the meat mix.

While this known method nevertheless has some attributes in spite of the above disadvantages, it is not capable of replicating the mechanical, physical and organoleptical properties of existing conventional sausages.

The principal purpose of the invention is a method for manufacturing of food strands with an edible casing in which the previous disadvantages of the known methods do not occur.

It is also the purpose of this invention to provide a novel linking method, advantageously used on continuous manufactured edible foodstuff strands, but can also be used in other sausage processing methods.

With the method according to the invention only the outside surface of the gel casing is being dried after the usual steps of co-extrusion and treatment with the coagulation means, by which moisture is being removed from the extruded gel, and the cross-linking of the collagen fibers is being facilitated, and thus the mechanical strength of the gel casing is increased. The strength which is achieved in this way is sufficient to provide a casing which can be further treated in the usual way. In the case of edible foodstuffs, i.e., sausage, manufacturing, it is possible to prepare in this way fresh smoked or cooked edible foodstuffs of which the properties are equal to those of known edible foodstuffs which have been manufactured in a natural or edible or non edible artificial casing.

The moisture content of the casing of the edible foodstuff after leaving the coagulation bath is approximately 90% or higher. With the drying of the outside surface of the gel casing the moisture content is lowered to a value whereby the casing will reach the desired mechanical strength. By adjusting the moisture content the mechanical strength of the casing can be adjusted to the desired value. Maximum strength of the casing can usually be achieved by lowering the moisture content to the range of 40-75%, for example, 50%.

The temperature of the meat under the casing will preferably stay low during the surface drying of certain types of sausages (for example below approximately 35 degrees C.) so that principally no coagulation of the food proteins such as meat proteins will occur. With other types of edible foodstuffs, the coagulation of the meat proteins can be desirable.

The drying of the surface of the formed casing can be effected with appropriate means. A device which is preferably being used for the drying is a surface dryer, whereby the casing is directly being irradiated by a radiation source whereby the moisture which is being removed out of the casing is being conducted away with the help of conditioned airflow. This conditioned airflow also prevents the sausage casing and the underlying meat mixture of being heated to unwanted temperatures. In this way a homogeneous drying of the casing is achieved down to for example 50% moisture in a short time of for example 30 seconds. An appropriate means of radiation is for example a source which emits middle wave infra red radiation.

Advantageously the method is provided with a separation step to separate the strand of foodstuffs into individual elements which are connected with each other. This can be effected in the usual way by crimping, twisting, clipping or tying before or after the surface drying of the strand of foodstuff which is provided with a casing.

In those places, where usually a twist, clip or such like is being used it is advantageous to isolate the individual elements with a chemical clip. In this application a chemical clip consists of a closure made up out of an edible or non-edible non-toxic material. Appropriate materials are for example, polyamide, polyethylene, cellulose and proteins and other natural or artificial polymers. Such a clip can for example occur by titrating, injecting, or spraying an appropriate quantity of an adequate material or materials so that in a short time by hardening a mechanical strong ring is being formed which holds the crimp during the following treatment steps of the strand of foodstuffs.

The invention also concerns a device for the manufacturing of strands of foodstuffs with a casing which is formed out of a protein, especially of sausage strands, which includes means for the co-extrusion of a principally homogeneous coating of gel around an edible product, as well as a coagulation bath for the chemical treatment of the extruded gel coating and transportation means for the transportation of the extruded strand of edible foodstuffs which is characterized in a surface dryer installed after the coagulation bath with a purpose of drying the gel casing.

Existing equipment and processes have other certain shortcomings. Among these shortcomings are extruders which are complex and cannot be easily adjusted so that the diameter of the food strand can be easily adjusted. Helical conveyors used for the strand are open and invite unwanted lateral movement of the strand during movement through the conveyer trough, and contamination is possible. Driers used are not highly efficient and are sometimes detrimental to the quality of the coating material.

It is therefore an object of this invention to provide a continuous food processing system that will permit an elongated strand of meat or the like to be coated with a coating material which is coagulated, crimped, dried, and conveyed in a rapid and efficient manner.

A further object of this invention is to provide an extruder which has a minimum number of parts and which can produce strands of different diameters.

A still further object of this invention is to provide an infrared drier to facilitate coagulation of the coating material.

A still further object of this invention is to provide an efficient crimping means for the coated strand which will not damage the coated edible strand.

A still further object of this invention is to provide a conveying system for an elongated strand of material that is sanitary and free from contamination.

These and other objects will be apparent to those skilled in the art.

The method for the manufacturing of foodstuff strands with a shaped casing of the aforementioned type according to the invention is characterized in fact that after the treatment with a chemical means moisture is being removed from the extruded gel casing through the drying of the exterior surface of the shaped gel casing.

SUMMARY OF THE INVENTION

A method and apparatus of continuously processing an elongated strand of plastic edible material coated with a coagulated coating. A co-extruder has interchangeable parts to provide strands of varying diameter. The strand is conveyed through a closed tubular conveyor through which a brine fluid is simultaneously passed. The drying of the strand includes an infrared drier. A linker and/or crimper is provided.

DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic flow diagram of the continuous meat processing system of this invention;

Fig. 1B is a top plan view of the apparatus of this invention;

Fig. 1C is a side elevational view as seen from the bottom of Fig. 1B;

Fig. 1D is an end elevational view as seen from the left hand end of Fig. 1C;

Fig. 1E is an end elevational view as seen from the right hand end of Fig. 1D;

Fig. 1F is an enlarged scale sectional view taken on line 1F-1F of Fig. 1B;

Fig. 2 is a longitudinal sectional view of the extruder of this invention;

Fig. 3 is an exploded view of the extruder showing interchangeable parts of the extruder to alter the size of the sausage diameter;

Fig. 4 is a flow diagram of the crimper and sealer of this invention;

Fig. 5 is a plan view of the pre-crimper of Fig. 4 shown at an enlarged scale;

Fig. 6 is an exploded view of the crimper of Fig. 4;

Fig. 7 is a side elevational view of the infrared drier.

Fig. 8 is an end elevational view of the right hand end of the infrared drier of Fig. 7; and

Fig. 9 is an enlarged detail view of Fig. 7 taken on line 9-9 of Fig. 8.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The principal components of the system shown in Fig. 1 are as follows:

1. Meatbatter pump
2. Gel pump
3. Coagulant injection
4. Extruder
5. Salt bath
6. Washer
7. Air dryer
8. Portioner
9. Surface dryer

Features of the above components are set forth in the following Table I.

Processing steps of the Continuous Casing Process.

Nr.	Description	Variables	Function	Process-sequence
1	Meat batter	1 Comminuted and semi comminuted 2 Fat, water, protein content . 3 Other non meat additives 4 Temperature 0 to 18 degrees celsius	1 To form the sausage rope with strong gelling and binding properties while optimizing yield	
2	Gel	1 Kind of collagen 2 Percentage of collagen in gel 3 Percentage of non collagen additives f.i. C.M.C., caramel, etc. 4 PH 5 Temperature 2 to 18 degrees celsius	1 To coat the meat rope and to be manipulated in a continuous and edible casing	
3	Coagulant injection	1 Kind and concentration of coagulant 2 Percentage of injection v. collagen 3 PH	1 To start crosslinking of the collagen 2 To start coagulation of the collagen and proteins of the meatbatter.	
		4 Percentage of salt	1 To deswell and dehydrate the collagen layer	See process step 5
4	Extruder	1 Revolution per minute f.i. from 50-300 2 Temperature 2 to 18 degrees celsius 3 Diameter of the rope from 8mm onwards	1 To form a continuous rope of constant diameter and coated with a layer of collagen gel of constant thickness f.i. 0.5 mm 2 To orientate the fibres of the collagen gel to facilitate the cross linking.	
5	Salt bath	1 Kind and percentage of salt 2 Temperature from 5 to 40 degrees C. 3 Time from 2 up to 60 seconds	1 To deswell and dehydrate the collagen layer 2 To allow time for coagulation of the collagen and the proteins of the meat	The salt bath may replace the salt injection via the coagulant injection or visa versa

TABLE I

6	Washing	1 Water or a less concentrated solution of the salt and/or diluted sugar. 2 Temperature from 5-40 degrees C. 3 Time from 2 up to 60 sec.	1 To reduce the percentage of salt in the collagen layer	The washing may be eliminated
7	Air dryer	1 Air flow 2 Air temperature 10 up to 40 degrees C. 3 Time f.i. 0.5 to several minutes.	1 to remove water from the coating 2 To facilitate the strengthening of the casing	In the case the saltbath is eliminated by the coagulant injection, the positioning is directly after the extruder
8	Portioner & sealer			
	1. Pre- crimper	1 The shape of the meatpusher 2 Rope speed, synchronised with the crimper 3 Crimper speed	1 To press the meat batter away from the crimp location	
	2. Crimper	1 Crimp speed 2 Rope speed synchronised with the pre-crimper	1 To form the definite crimp 2 To form the mold to shape the polymer donut	
	3. Sealer	1 Kind of polymer f.i.; non edible: polyamide, LDDE edible: natural polymers 2 Temperature f.i. 120 -230 degrees C. 3 Time to cool of the polymer	1 To form a donut to hold the crimp during further processing	For some sausages it is advantaguous to use a heatseal instead of a donut crimp. The heatseal may be made by means of ultrasonic heating
9	Surface dryer	1 Radiation intensity	1 To strengthen the casing by heating the the casing above shrinktemperature of the collagen gel, up to 80 degrees C. without coagulating the proteins of the meatbatter, if desired	The surface dryer may replace the air dryer or vice versa

The extruder 4 is best shown in Figs. 2 and 3. The components of the extruder are as follows:

1B.	Front plate
2B.	Water seal
3B.	Outside planer
4B.	Bolt
5B.	Inner planer
6B.	Bolt
7B.	Flange
8B.	Bolt
9B.	Dual extruder tube
10B.	Casing
11B.	--
12B.	Shaft
13B.	Gears
14B.	Cradle
15B.	Tube
16B.	(Arrow)
17B.	--
18B.	--
19B.	Port

Fig. 3 shows how members 1B, 3B, 5B and 9B can be removed from extruder 4. They can be replaced with similar components which have a different set of discharge orifices 100, 101, 102 and 103 to create a strand or rope 1A (Fig. 1A) of varying diameters.

With reference to Fig. 2, casing 10B is stationary, shaft 12B and gears 13B rotate cradle 14B around tube 15B. Member 3B rotates in a direction opposite to member 5B. This causes the

fibers in the coating gel to be oriented as the gel moves in the direction of arrow 16B between these two components to be coated on the meat strand exiting from orifice 103 on coextrusion horn 9B. A gel material mixed with a coagulation agent is introduced into horn 9B through port 19B. Meat emulsion or the like is introduced at 20B.

The collagen dough containing a cellulose ether (gel) and the meat batter are fed to the extruder by a stuffer with a constant volume frequency controlled motor. In the extruder the sausage batter and the collagen gel are extruded simultaneously, so that a continuous rope of sausage is formed with a collagen coating.

The method of extruding comprises feeding under pressure the fluid of collagen fibrils (gel) into a passage way (see arrow 16B) between opposed planer surfaces, rotating said surfaces relative to each other to provide shearing forces to the collagen mass before extrusion. A frequency controlled electro motor provides the rotation of the planer surfaces in opposite senses at 60 to 125 rpm. The two planer surfaces constitute an extrusion die, the gap between them being 0.5mm.

The lay out crimper and sealer 104 are shown in Figs. 4 and 5. The component parts and function thereof are shown in the following Table II.

Table II

Crimper and Sealer

Nr.	Description	Function
0C	Sausage rope	-
1C	Pendulum	- To adjust speed (to control the main drive on the crimp-seal machine).
2C	Pre-crimper	- To force the meat batter away from the location of the crimp.
3C	Turning wheel	- To guide the sausage rope.
4C	Crimp-sealer	- To make the crimp by lowering the crimper into the support plate by means of a cam construction. - To lower the dosing unit and to press the nozzle on to the crimper. - To lift the dosing unit, nozzle and crimper after donut is formed. - To set the length of the individual sausages (number of units on the wheel).
5C	Dosing unit	- To inject an control the amount of polymer into the mould formed by the support plate and the crimper plate. In case of a heat seal, the dosing unit is replaced by a heating element f.i. a ultra sone welder.
6C	Polymer Preparation tank.	- To mix and heat the polymer.

The crimper 105 (Fig. 6) has the following components and functions:

Table III

Crimper

1D	Polymer inlet	-
2D	Connection electricity	-
3D	Dosing valve	- To dose and control the amount of polymer per donut (crimp)
4D	Roller	- Guided by a circular cam construction to control the vertical movement.
5D	Spring	- To press the nozzle away from the crimper.
6D	Nozzle	-
7D	Crimper	- To make the crimp and to form a die for the donut.
7D'	Slot	-
8D	Support plate	- To support the sausage rope and form the contra part of the crimper.
9D	Chain	- To transport the sausage rope.
10D	V-shaped notch	- To crimp strand
11D	V-shaped notch	-
12D	Space	

A frame (not shown) supports chain 9D to which is secured plate or die 8 which has a V-shaped groove 10D therein. The frame also supports

elements 1D-7D. Crimper (die) 7 has an inverted V-shaped groove 11D therein and dwells in the same plane as die 8. Space 12D permits a strand of product to pass therethrough. Die 7D has notch 7D' therein to receive die 8D. An adhesive or polymer deposits a donut-shaped quantity of adhesive in each crimp in the strand by action of 1D-6D.

The infrared drier is shown in Figs. 7, 8 and 9, and has the following components and functions:

Table IV

Infrared Drier

Nr.	Description	Function
1E	Sausage rope	On support plates
2E	Transport chain	- To carry the sausage rope through the dryer
3E	Chain wheel	- To pull the chain
4E	Power unit	- To provide a controlled speed.
5E	Ventilator	- To provide airflow for cooling the IR radiators and the surface of the sausage rope, and to transport the vaporized moisture.
6E	Air recirculation ducts with regulation valves	- To control air recirculation
7E	Air inlet duct	
8E	Air pressure chamber	- To divide the air over the functional openings
9E	Air exhaust ventilator	- To control the amount of circulation air

10E	Support plate	
11E	IR radiator	- To provide the energy for vaporizing the moisture in the casing.
12E	Reflection mirror	- To reflect the radiation energy for effective use on the sausage rope.
13E	Opening for cooling IR radiator	- To control the temperature.
14E	Opening for cooling sausage rope	- To control the rope temperature and to take away the vaporized moisture.
15E	Restriction plate	- To provide overpressure in the drying zone.
16E	Air recirculation chamber	
17E	Frequency control unit	- To regulate the frequency of the IR radiation
18E	Arrows	- To indicate air flow
19E	Arrows	- To indicate infrared radiation.

The arrows 18E indicates air flow, and the arrows 19E indicate infrared radiation.

Figs. 1B-1E show the overall layout of the machine for processing the meat strand. Of particular importance is the serpentine (helix or spiral) tube 106 which receives the coated strand 1. The strand is conveyed by the brine through tube 106 to a depositing station 107. The tube is coiled horizontally, and a quantity of brine is flushed through tube 106 while the gel coated strand is floated downwardly therethrough to further assist in the curing and coagulation of the coating material.

Because the interior of the tube is entirely closed, as compared to a U-shaped trough with an open top, contamination of the interior of the tube is avoided. (See Fig. 1F.)

Meat dough is introduced into the system at 108, and collagen dough (gel) is introduced into the system at 109.

From the foregoing it is seen that the device and method of this invention will accomplish at least all of the stated objectives.

What is claimed is:

1. The method for making an extruded food product comprising, forming an elongated strand of food product by simultaneously co-extruding said strand and a hardenable coating substance on the outer surface thereof and subjecting said coated strand to a source of irradiation energy to harden said coating substance.

2. The method of claim 1 wherein said coated strand is conveyed through a closed serpentine-shaped conveyor, and simultaneously directing a quantity of reactive solution through said conveyor to further cure said coating material.

3. The method of claim 1 wherein said irradiation source is controled so that said coating material is sufficiently dried to a tensile strength sufficient to contain said strand for linking and handling without substantially changing the chemical structure of said strand.

4. The method of claim 3 wherein the temperature of said strand does not exceed 40° C.

5. The method of claim 3 wherein a quantity of air is passed over said coated strand while being subjected to said irradiation source to remove vaporized moisture from said coating substance and to minimize the temperature rise in said strand.

6. The method of claim 1 wherein said coated strand is subjected to said source of irradiation until the tensile strength of said coating substance increases by a factor of 2 or more.

7. The method of claim 1 wherein said coated strand is portioned into a plurality of links.

8. The method of claim 1 wherein said coated strand is portioned into a plurality of connected links.

9. The method of claim 7 wherein said links have link points surrounded by a hardenable substance to retain their linked condition.

10. The method of claim 7 wherein said links have link points surrounded by a edible hardenable substance to retain their linked condition.

11. An extruder for a coated edible strand of food product, comprising, a housing, an elongated center tube in said housing having first and second ends, an extrusion horn removably mounted in said housing and having inlet and discharge ends, removable closure means on said housing and having an orifice in communication with the discharge end of said horn, said center tube having an inner diameter larger than said extrusion horn so that said horn can be replaced by a second horn of a different diameter by removing said closure means.

12. The extruder of claim 11 wherein said horn has elongated inner and outer concentric compartments for coextruding into a single strand different plastic materials, said extruder having separate parts for receiving said different plastic materials.

13. The extruder of claim 12 wherein said extruder has a passageway existing between surfaces rotating in opposite directions at the outlet end of said outer compartment so that material in said outer compartment will have to move through said passageway before coating the exterior surface of the material being discharged from said inner passageway.

14. A device for making an edible product, comprising, extruding means for extruding an elongated strand of edible product, means operatively connected with said extruding means for placing a coating material on said strand wherein said coating material can be coagulated to have a density and stiffness greater than said edible product, an enclosed helically-shaped tube operatively connected to said extruding means to serve as a conduit for moving said coated strand of edible material to a depositing station, and means operatively connected to said tube for passing a fluid through said tube with said strand of edible material to enhance the coagulation of said coating material.

15. A device for crimping an elongated strand of edible material, comprising, two pairs of opposite sprockets having continuous chains thereon, with the centers of each pair of sprockets being disposed on a longitudinal axis, with the axis of each pair of sprockets converging towards each other, and with one sprocket of each pair being closely tangentially spaced from each other with the space therebetween creating a passageway, arcuate crimper elements generally spaced on said chains and symmetrically spaced on said chains so that the crimper elements on one chain will converge towards corresponding crimper elements on the other chain in said passageway so that said strand will be forcibly crimped and reduced in size as crimper elements on each chain converger towards each other in said passageway.

16. A crimper for crimping and securing a link point in an elongated strand of edible food product, comprising, a frame, an elongated movable chain on said frame, a pair of oppositely disposed die elements having oppositely disposed crimping surfaces thereon and being normally spaced to permit a strand of edible food product to pass therebetween in a direction normal to the plane of said die elements, first means on said frame for causing said die elements to converge to create a crimp in a strand of edible food product extending therebetween, and second means for depositing a hardenable material on said crimp to maintain said crimp in said strand.

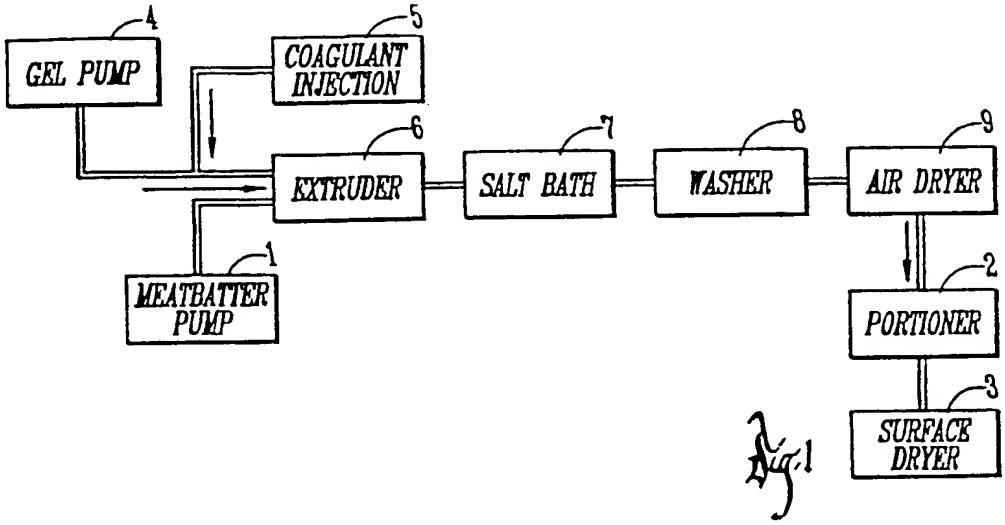
17. The device of claim 16 wherein said second means is positioned adjacent one of said dies for delivering of said hardenable material through one of said dies.

18. The device of claim 16 wherein one of said dies has a slot opening for receiving a portion of the other of said dies when said strand is crimped.

19. A crimper for crimping and securing a link point in an elongated strand of edible food product, comprising, a frame, an elongated movable chain on said frame, a pair of oppositely disposed die elements having oppositely disposed crimping surfaces thereon and being normally spaced to permit a strand of edible food product to pass therebetween in a direction normal to the plane of said die elements, first means on said frame for causing said die elements to converge to create a crimp in a strand of edible food product extending therebetween, and means on said frame for heat sealing said crimp to maintain said crimp in said strand.

20. An infrared drier chamber for treating an extruded strand of edible food product, comprising, a compartment having opposite side walls, a chain mounted within said compartment and mounted for progressive vertical movement therethrough through a progression of chain layers, means for supporting an elongated strand of edible meat product on said chain, a plurality of infrared generators in said compartment, and a plurality of air ducts in said chamber.

21. The device of claim 20 wherein a plurality of reflection mirrors are mounted in said compartment.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COAGULANT INJECTION
6
EXTRUDER
7
SALT BATH
8
WASHER
9
AIR DRYER
1
MEATBATTER PUMP
2
PORTIONER
3
SURFACE DRYER

Fig. 1

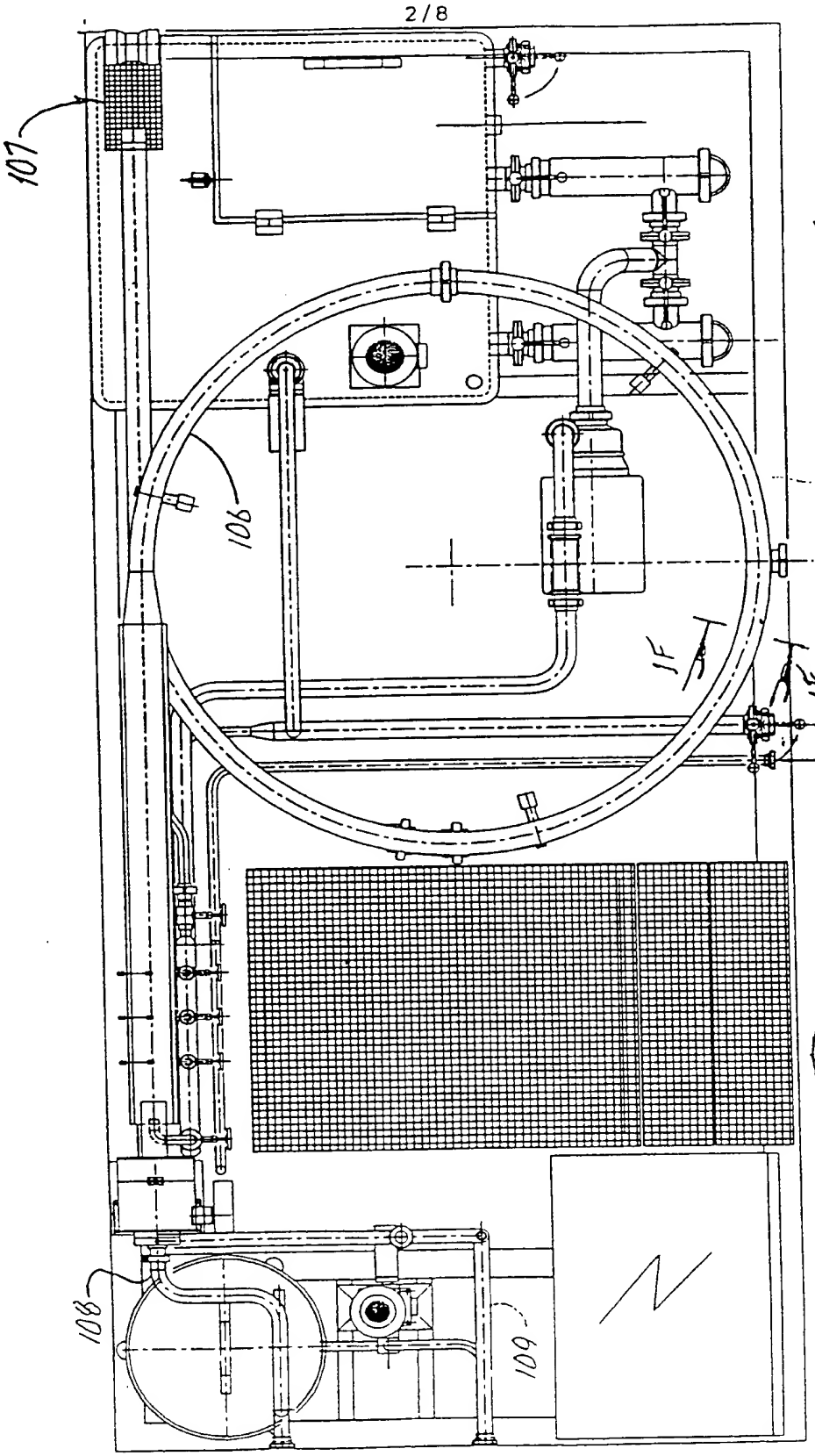

Fig. 1B

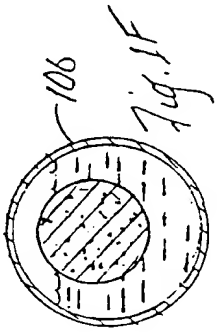

Fig. 1F

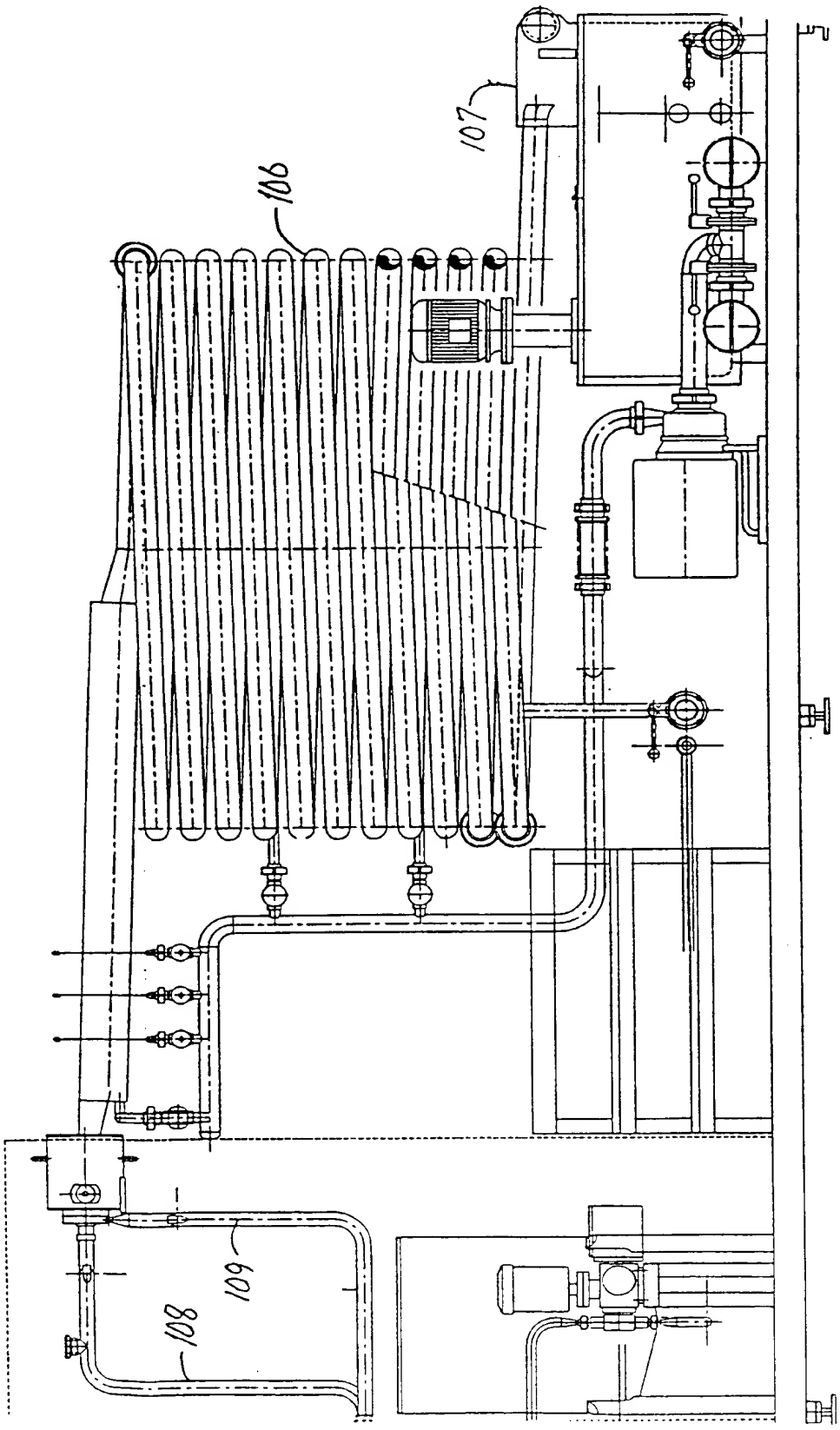

Fig. 1C

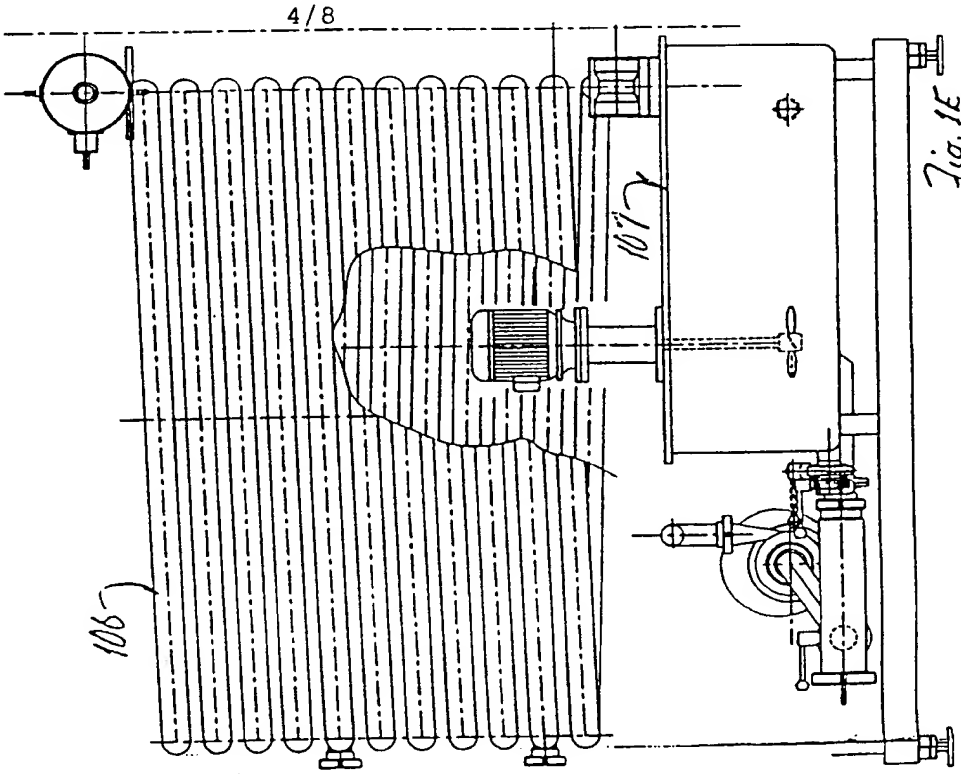

Fig. 1E

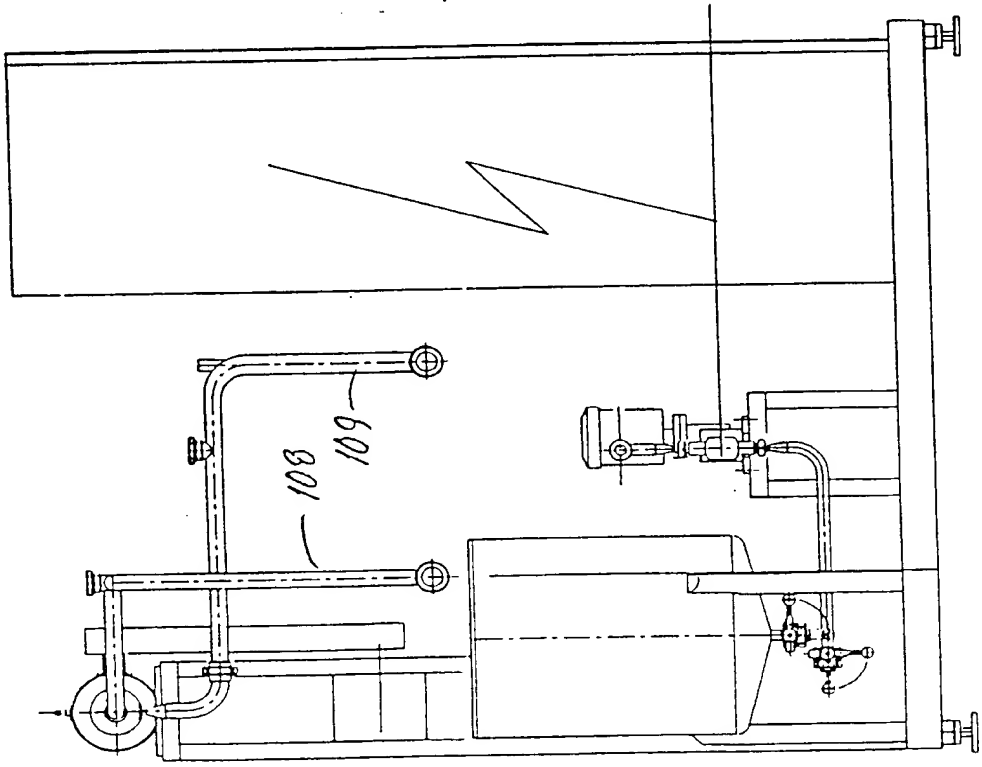

Fig. 1D

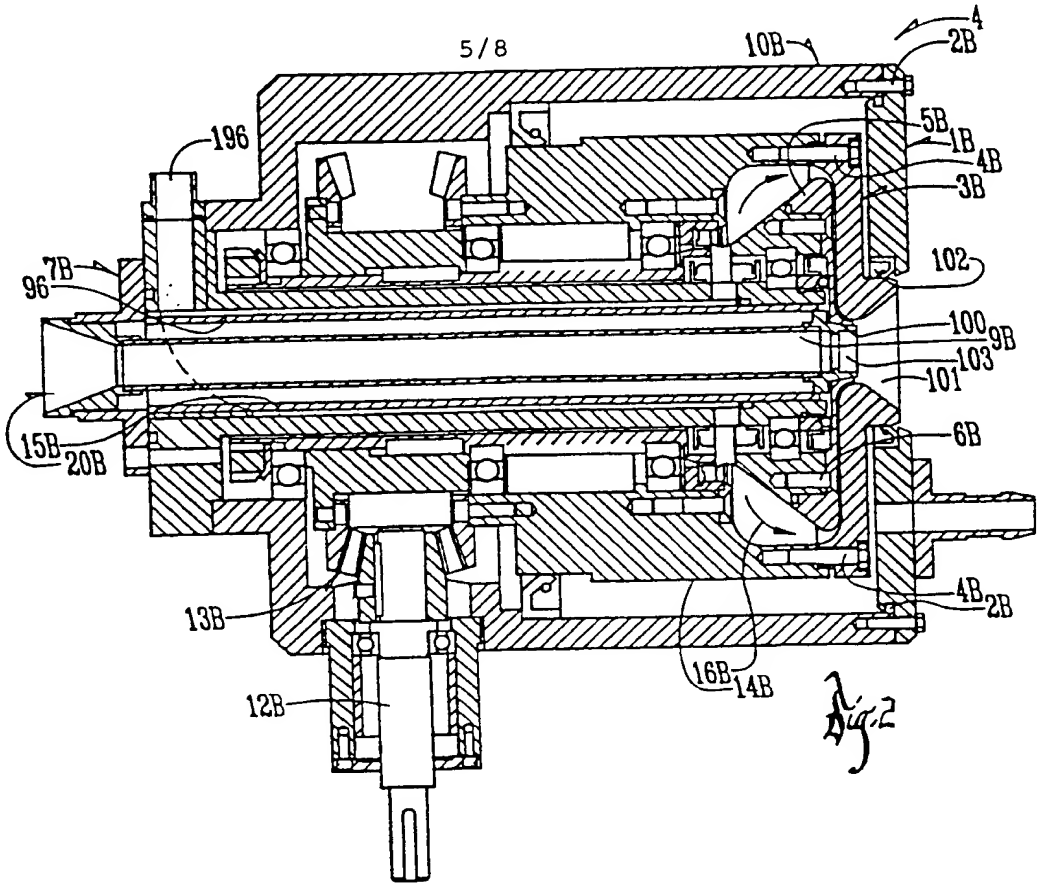
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Fig. 2

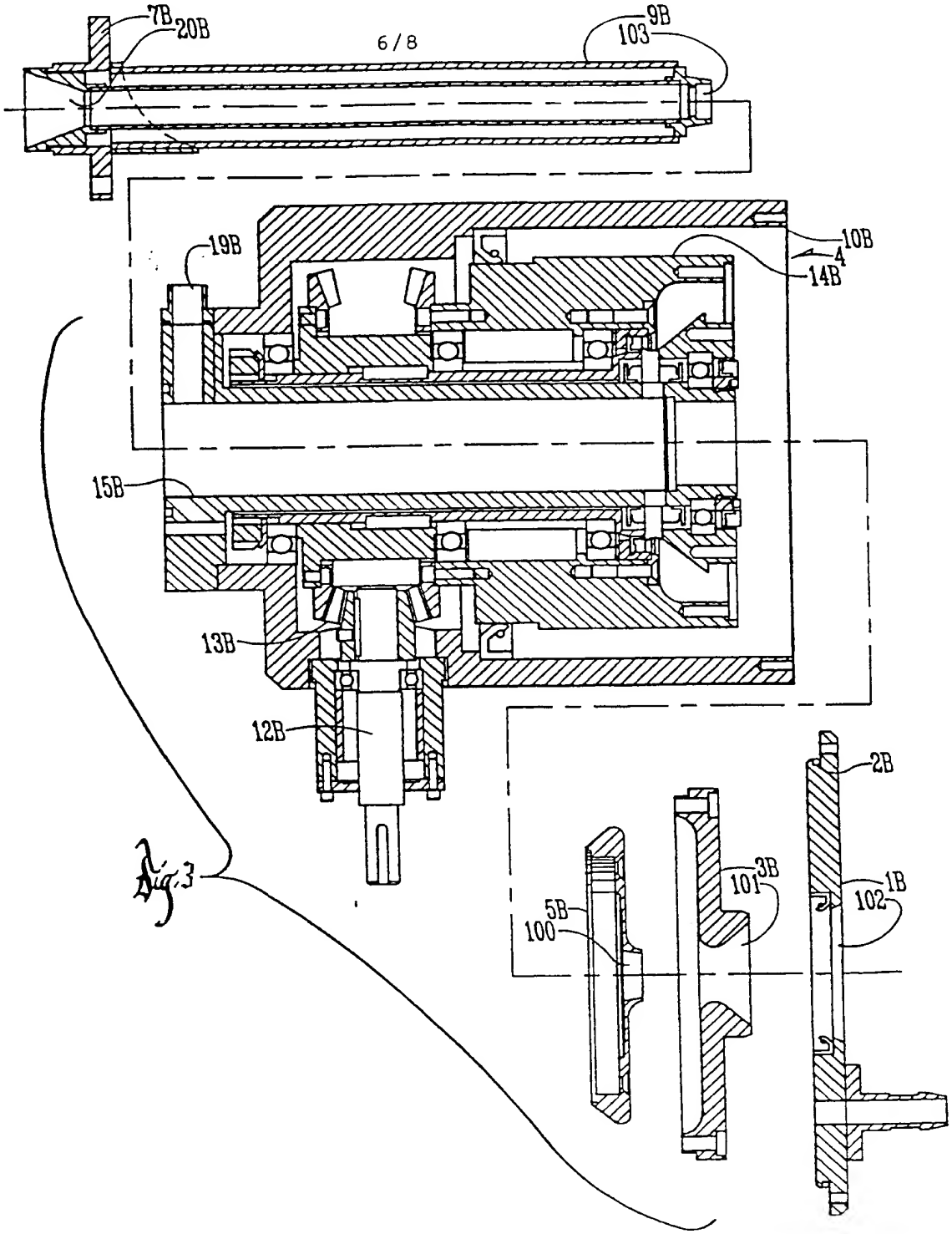


Fig. 3

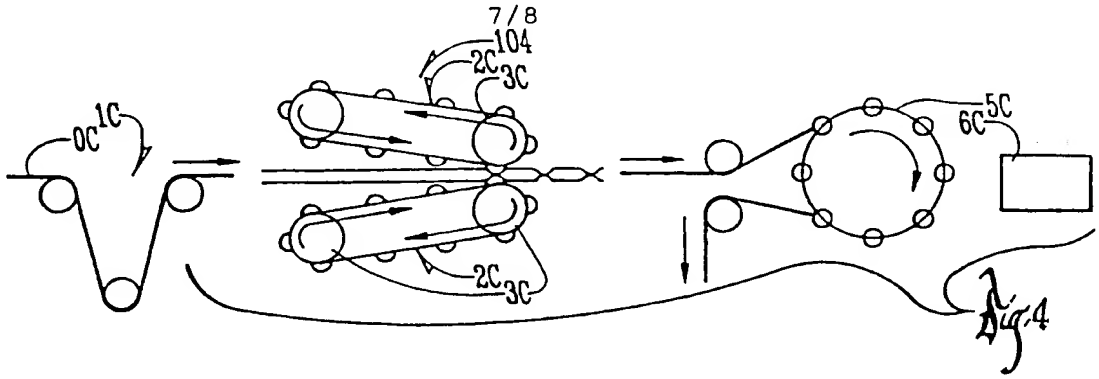
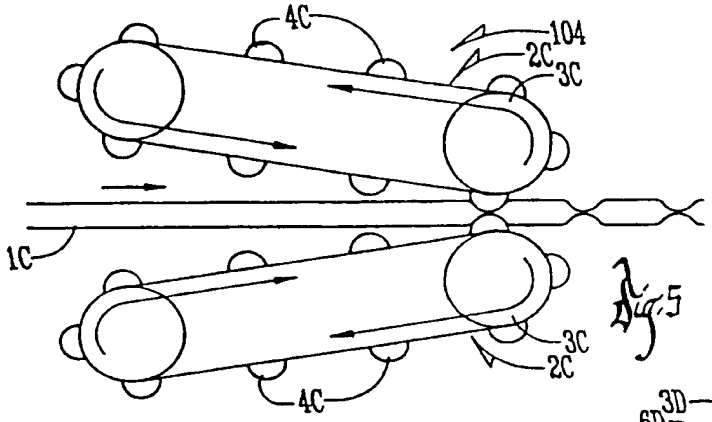


Fig. 4



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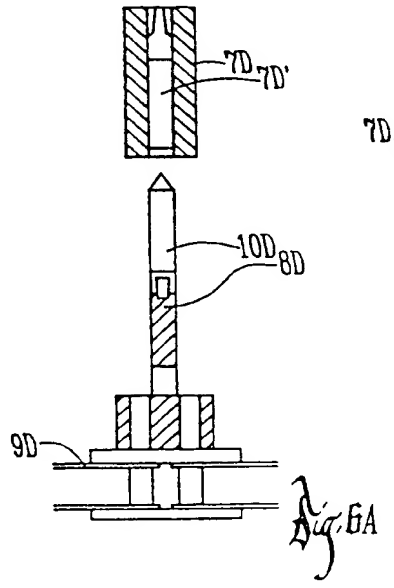

Fig. 6A

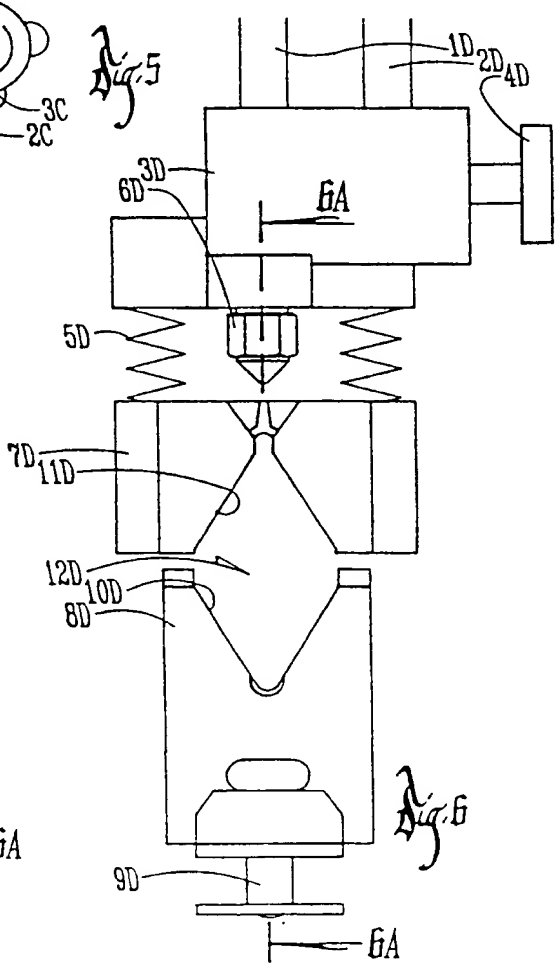

Fig. 6

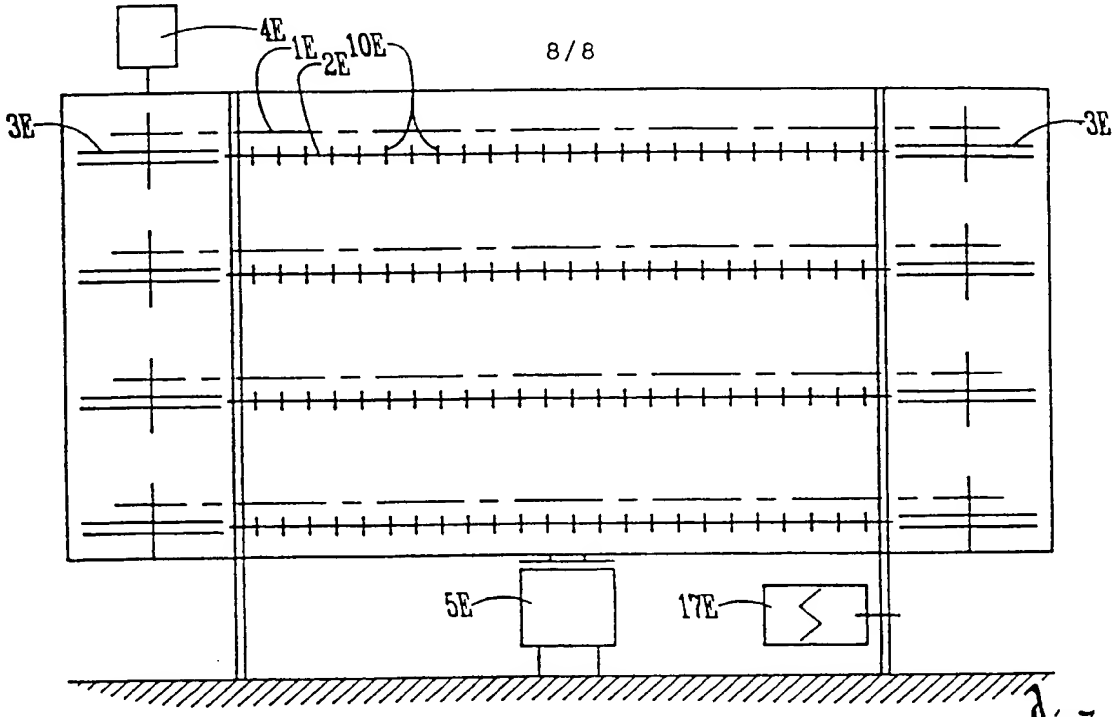

Fig. 7

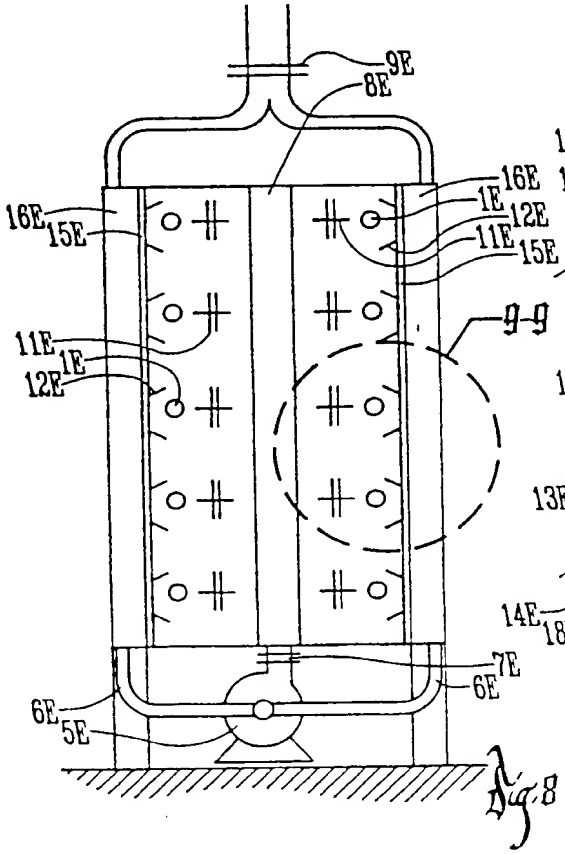

Fig. 8

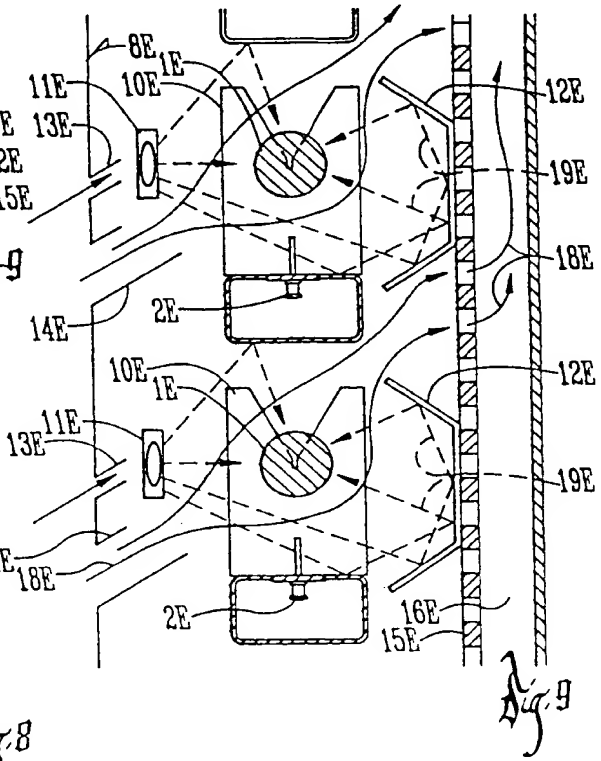

Fig. 9

REQUEST FOR RECTIFICATION UNDER RULE 91.1(f)

TO THE INTERNATIONAL BUREAU OF WIPO

APPLICANT: TOWNSEND ENGINEERING COMPANY
INT'L APPL. NO: PCT/US94/11474
INT'L FILING DATE: 11 OCTOBER 1994 (11.10.94)
TITLE: CONTINUOUS FOOD PROCESSING SYSTEM

REQUEST FOR RECTIFICATION OF REFUSAL IN PART

International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, SWITZERLAND

Dear Sir:

In response to the Notification of Decision Concerning Request for Rectification (Form PCT/ISA/217) from the European Patent Office dated 1 February 1995, enclosed herewith are eight new pages of drawings (Figures 1 - 9).

With its Response to Invitation to Correct Defects in the International Application, Applicant inadvertently submitted drawings which were submitted with a United States Continuation-In-Part application based on Netherlands application No. 9400602 from which priority in this PCT application is claimed.

Enclosed herewith is submitted a Bank Draft for $134 Swiss Francs as outlined in Annex B2, Volume 1 of the PCT Applicant's Guide.

Respectfully submitted,

Donald H. Zarley, Reg. 18,543
ZARLEY, McKEE, THOMTE, VOORHEES
& SEASE
801 Grand Avenue, Suite 3200
Des Moines, Iowa 50309
515-288-3667

Dated: 6 February 1995

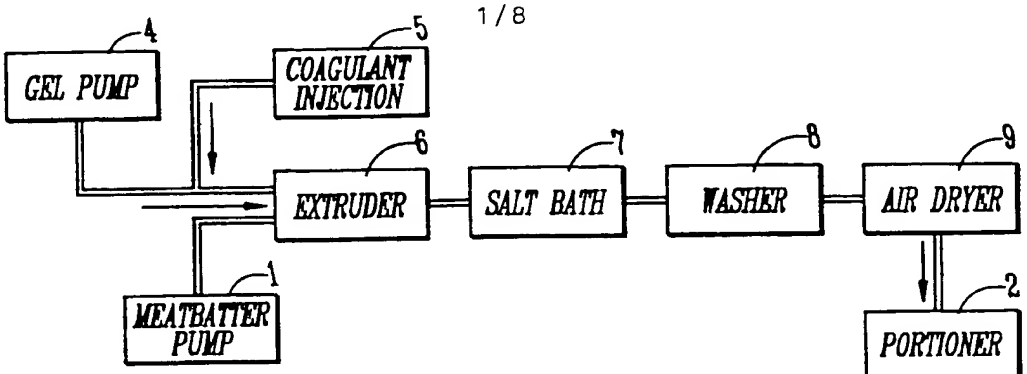
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Fig. 1

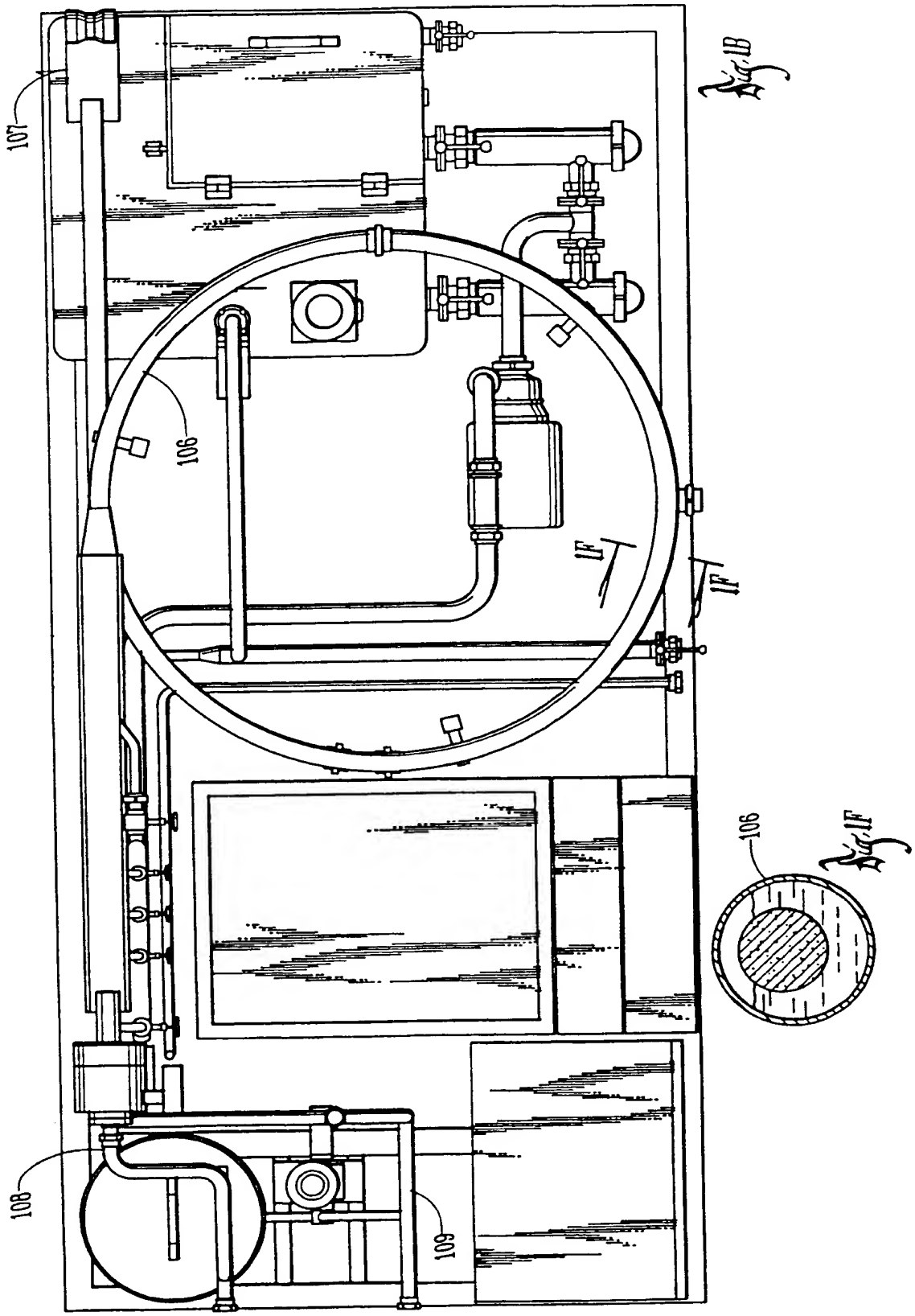

Fig. 1B

Fig. 1F

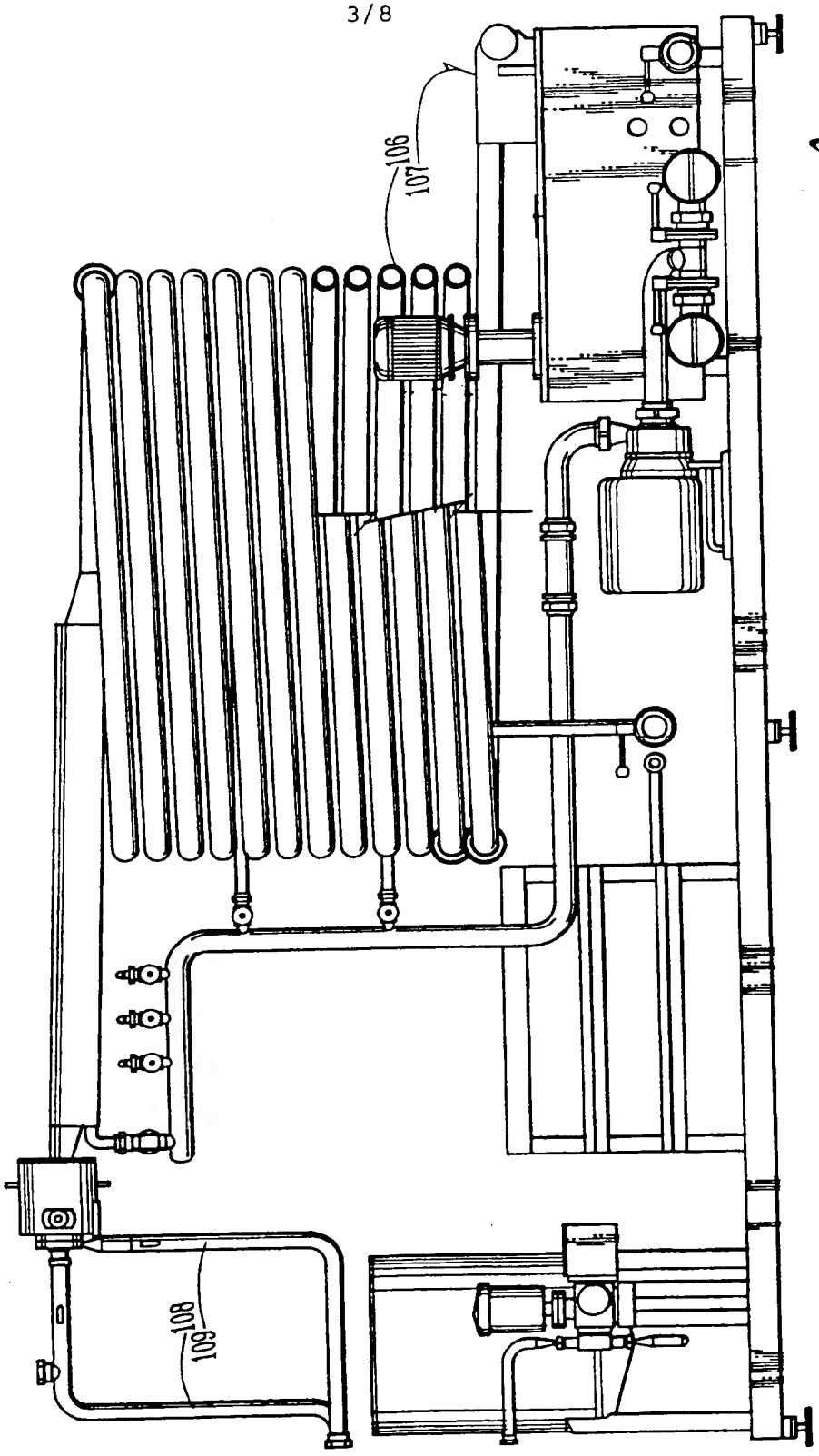

Fig. 1C

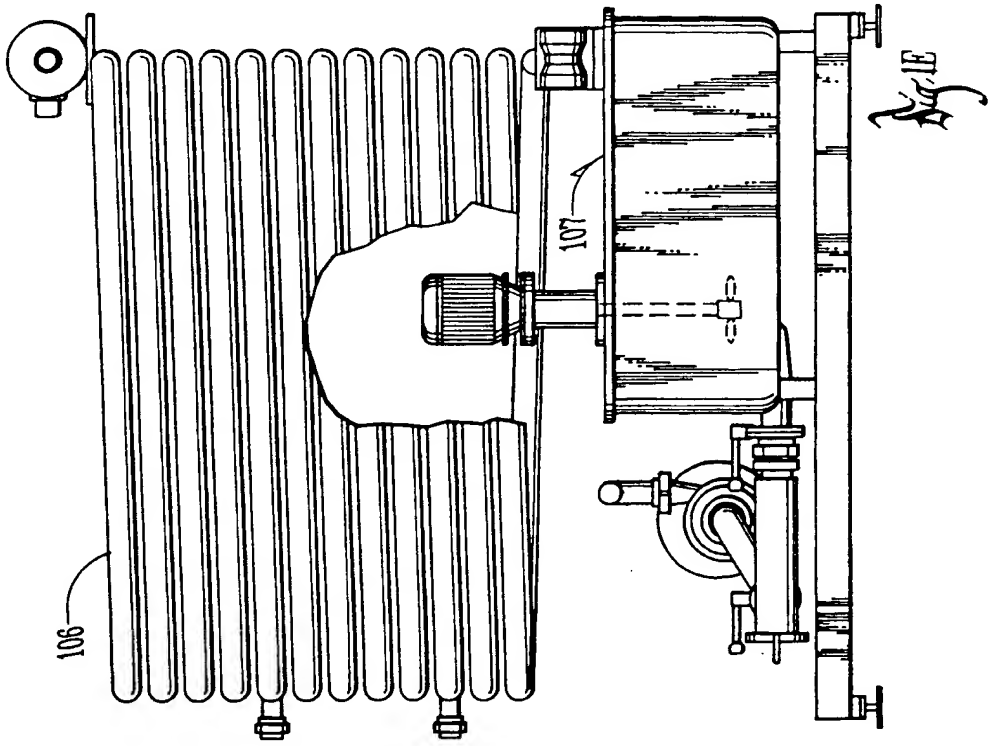

Fig. 1E

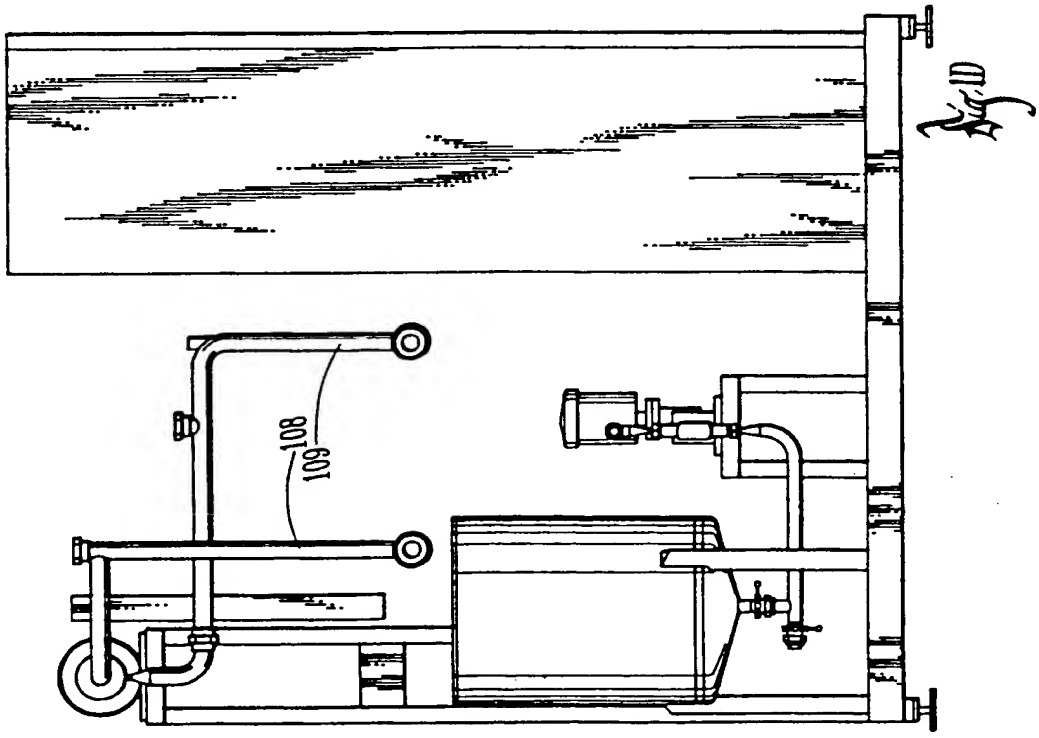

Fig. 1D

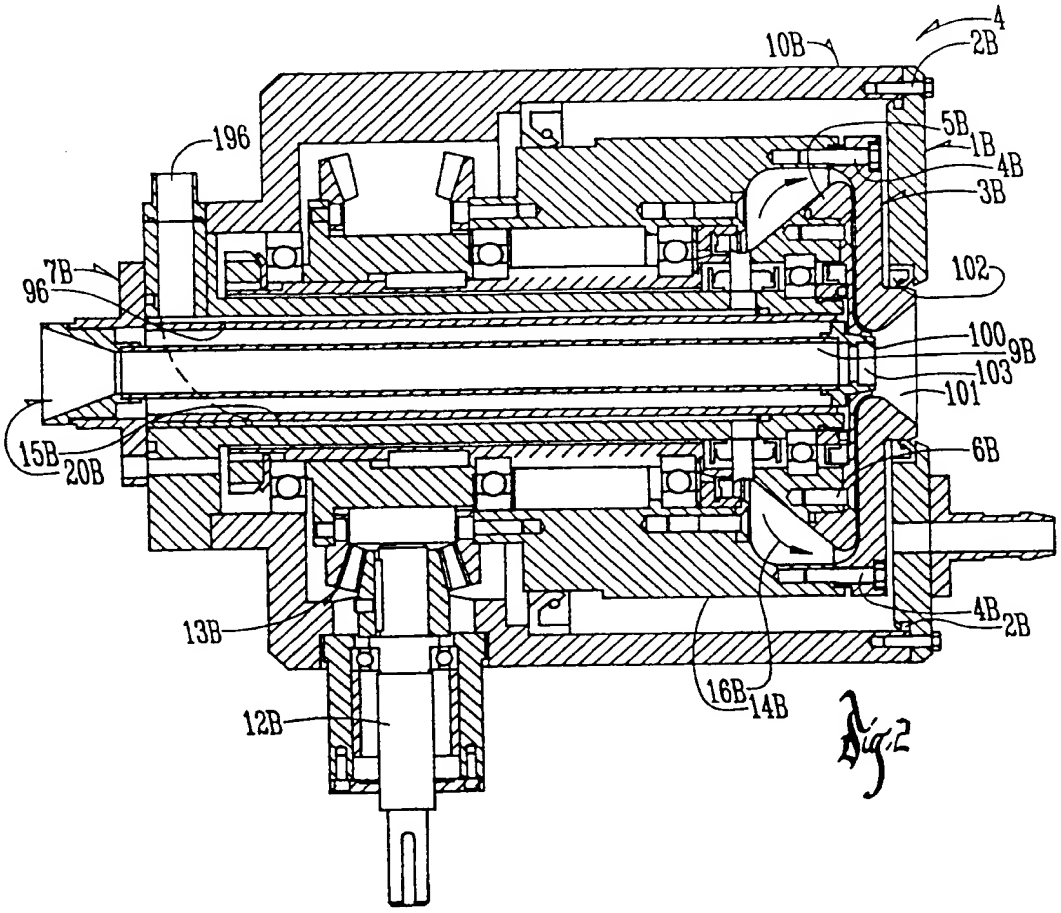
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Fig.2

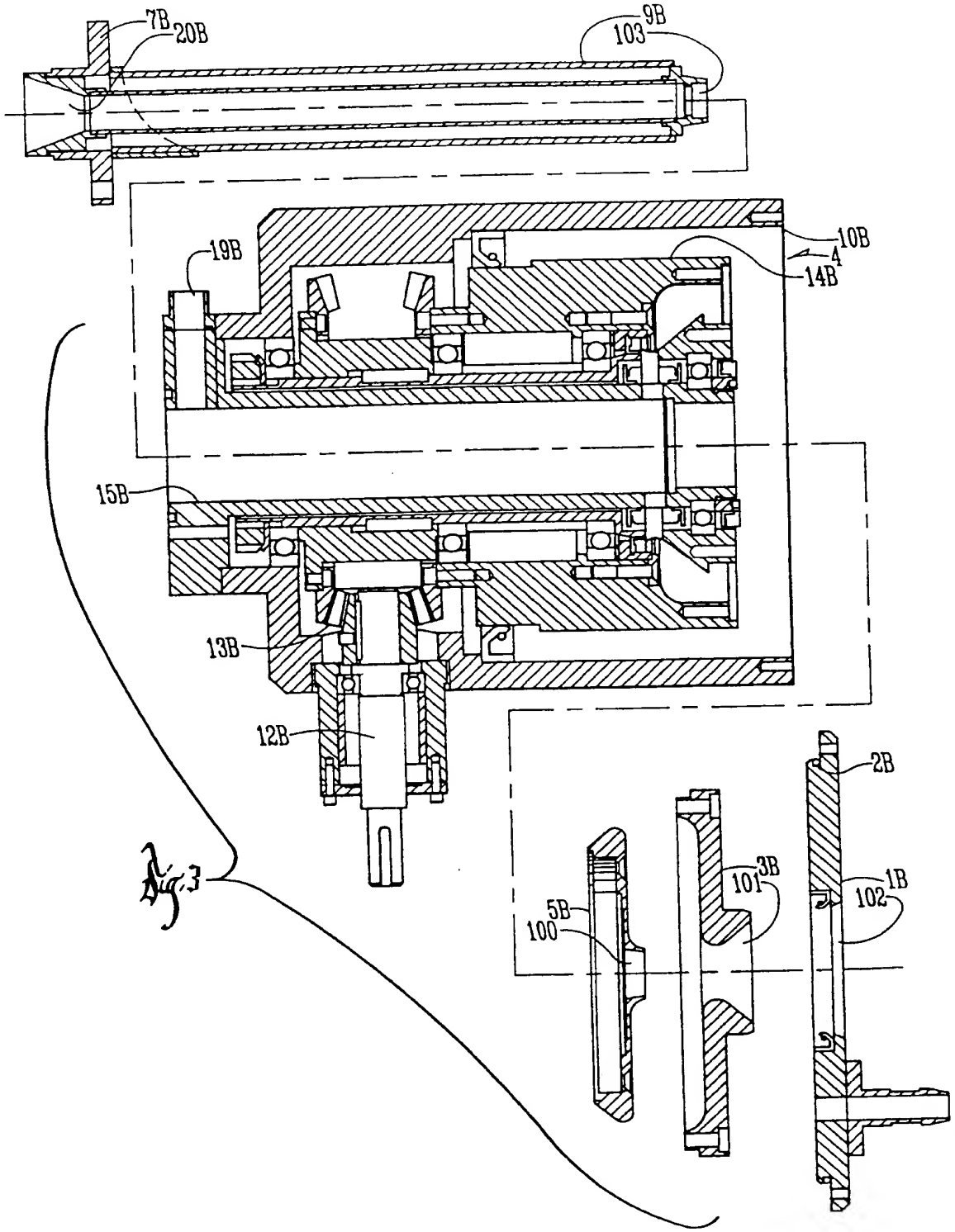


Fig.3

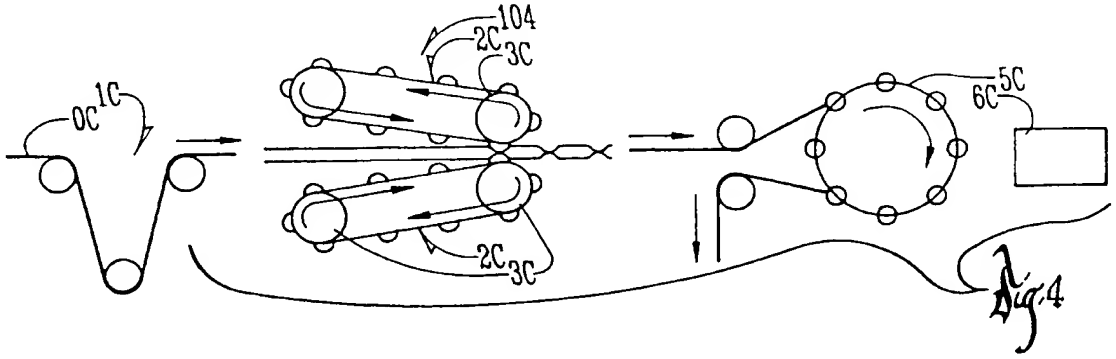


Fig.4

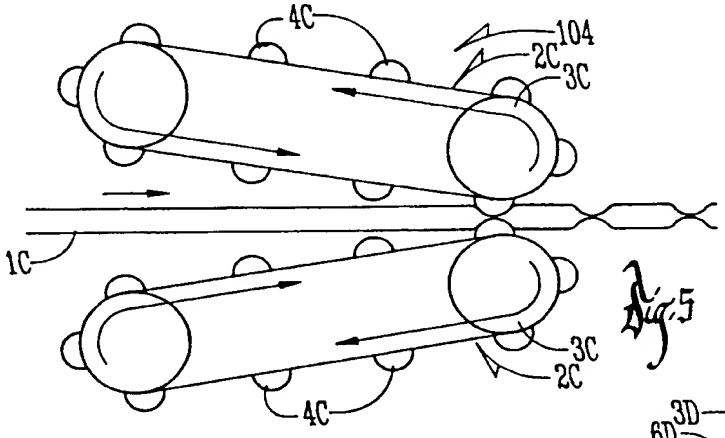
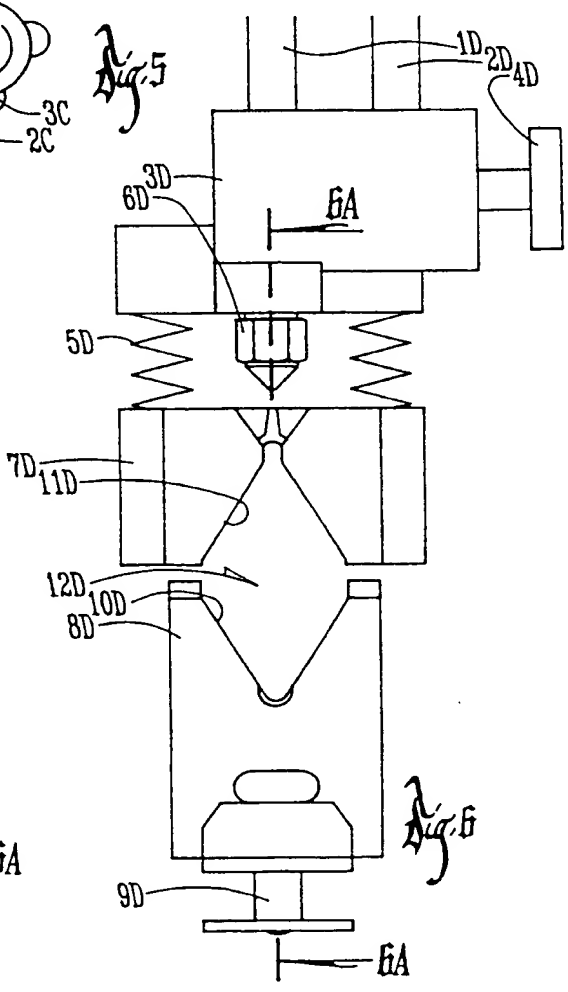


Fig.5



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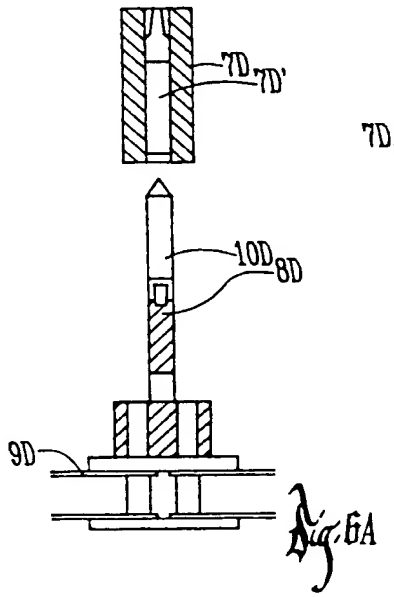
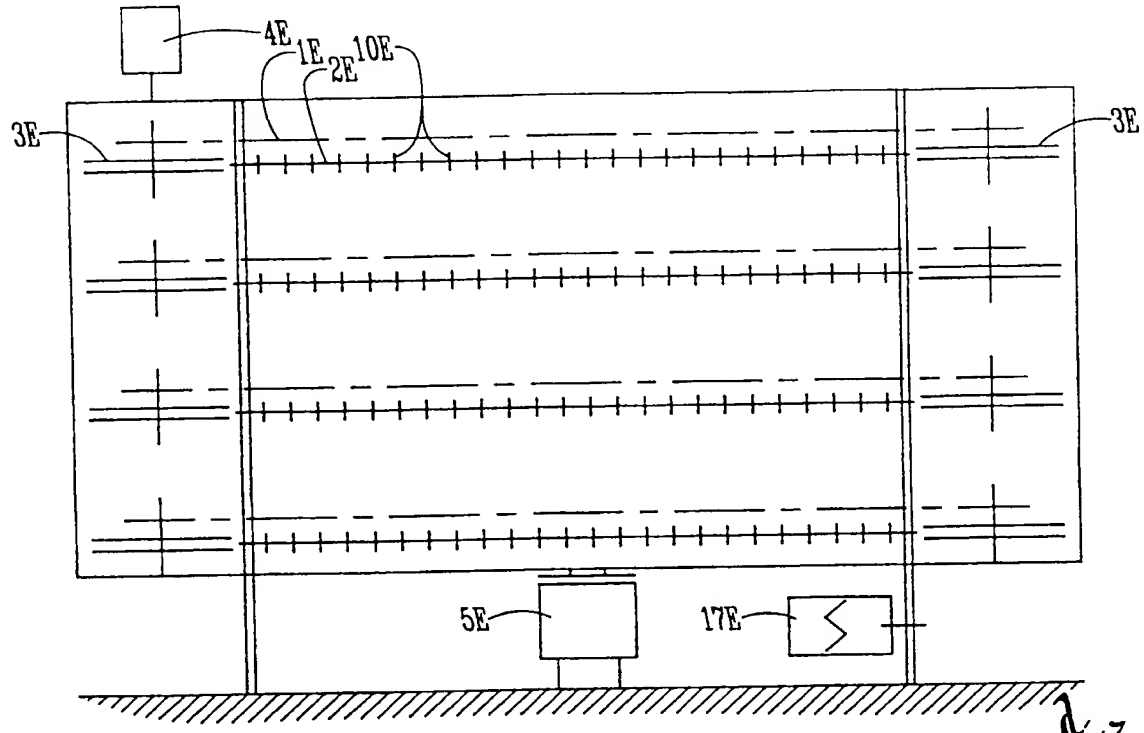


Fig.6A



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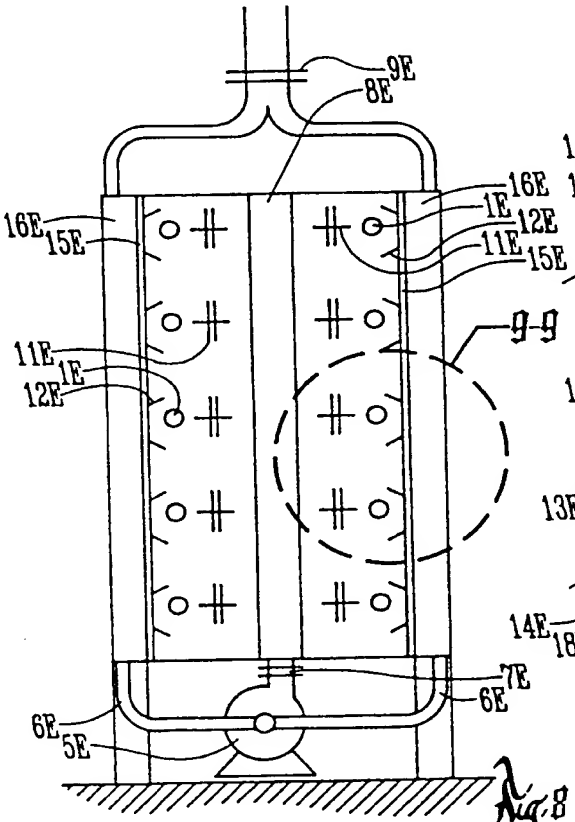

Fig.8

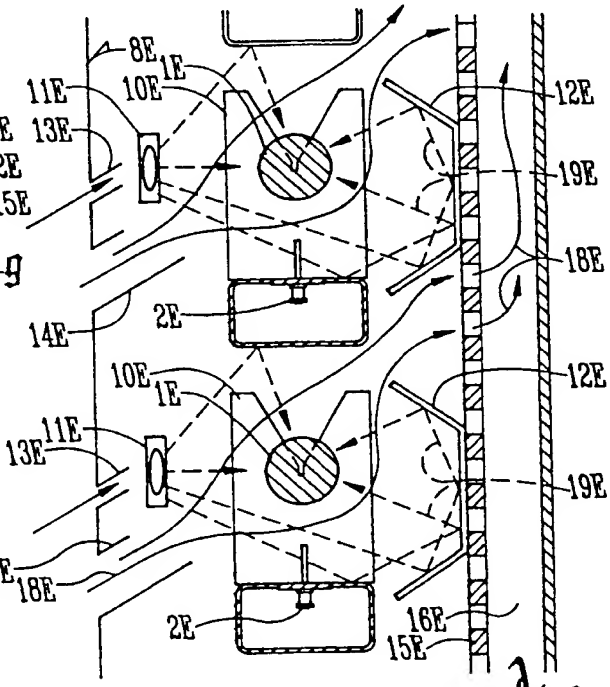

Fig.9

INTERNATIONAL SEARCH REPORT

International application No
PCT/US 94/11474

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A22C13/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A22C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO,A,93 12660 (DEVRO LTD.) 8 July 1993 cited in the application see claims 1-18	1-21
Y	DE,B,10 17 898 (WALTER BECKER) 17 October 1957 see the whole document	1-21
Y	US,A,3 122 788 (E. R. LIEBERMAN) 3 March 1964 cited in the application see the whole document	1-21
A	DE,A,15 70 178 (UNILEVER N. V.) 5 March 1970 see claims 1-16	1

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 January 1995	10. 02. 95

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Permentier, W

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Intern. al Application No
PCT/US 94/11474

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,3 408 918 (R. D. TALTY) 5 November 1968 see claims 1,2	1
A	GB,A,1 119 284 (UNILEVER LTD.) 10 July 1968 see claims 1-12	1
A	EP,A,0 520 257 (W.R. GRACE & CO) 30 December 1992 see page 3; claims 1,27-36	1
A	GB,A,859 804 (UCC) 25 January 1961 see claims 1-21	1

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INTERNATIONAL SEARCH REPORT

Intern. al Application No
PCT/US 94/11474

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
WO-A-9312660	08-07-93	AU-B-	3168693	28-07-93
		CA-A-	2126845	08-07-93
		EP-A-	0618771	12-10-94
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US-A-3122788	03-03-64	CH-A-	443863	
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